REMARKS

The application has been amended as needed so as to place it in condition for disposal at the time of the next Official Action.

The Official Action had objected to the specification as it lacked section headings, as well as a reference to the earlier international application.

By the present amendment, it will be seen that the subject headings have been inserted at the appropriate locations throughout the specification in a manner consistent with the preferred guidelines as set forth at §601 of the Manual of Patent Examining Procedure (MPEP). The reference to the international application has been provided.

Claims 6 and 10 were rejected under 35 USC 112, second paragraph, for indefiniteness and as being improper dependent claims for failing to further limit the subject matter of a previous claim. Specifically, the Official Action states that the use of the term "may" renders these claims vague and indefinite.

Reconsideration of the above rejection is respectfully requested for the following reasons.

By the present amendment, original claims 1-20 have been canceled, and replaced with new claims 21-40, which refrain from using the vague term "may". Thus, new claims 21-40 are believed to set out and circumscribe a particular waste treatment

plant, with a reasonable degree of precision and particularity, when read in light of the teachings of the original specification. It is respectfully submitted that a person having ordinary skill in the art would be reasonably apprised of the metes and bounds of new claims 21-40. Accordingly, it is believed that the rejection of claims 6 and 10 under 35 USC 112, second paragraph, has been overcome, and should not be applied to any of new claims 21-40.

Claims 1, 2, 4, 6, 7, 11-13 and 19 were rejected under 35 USC 102(b) as being anticipated by the German reference 39 16 520.

Claims 3, 5, 18 and 20 were rejected under 35 USC 103(a) as being unpatentable over the German reference in view of STUTH 5,202,027 or CROSBY 4,391,703. The Official Action states that these claims differ from the basic German reference in the recitation of an upper screen and/or buoyant carriers. The secondary references to STUTH and CROSBY are relied upon as teaching the use of buoyant carriers and upper and lower screens. It is concluded that it would have been obvious to one of ordinary skill in the art to have used buoyant carriers in the waste water treatment plant of the German reference with upper and lower screens, as taught by the secondary references.

Claims 1, 2, 6 and 11-13 were rejected under 35 USC 102(b) as being anticipated by YABUUCHI et al. 4,139,456 in view of the Japanese reference 3-101896.

Claims 1, 2, 5, 6, 7, 11 and 20 were rejected under 35 USC 102(b) as being anticipated by OSHIMA et al. 4,933,076.

Claims 3, 4, 18 and 19 were rejected under 35 USC 103(a) as being unpatentable over OSHIMA et al. The Official Action states that these screens call for upper and lower screens, which appear to be disclosed in Figure 1 by the patented reference to OSHIMA et al. Consequently, it is concluded that it would have been obvious to one of ordinary skill in the art to use upper and lower screens in the OSHIMA et al. waste water treatment plant.

Claims 16 and 17 were rejected under 35 USC 102(b) as being anticipated by any one of SANYAL et al. 5,217,616, CHOUN 3,543,937 and German references 196 33 629 and 35 16 617.

Claim 16 was rejected under 35 USC 102(b) as being anticipated by any one of JAGER 4,581,299, HOON, Jr. 3,758,087, IKAWA 4,113,810 and HACKENJOS 4,203,935.

Claim 17 was rejected under 35 USC 103(a) as being unpatentable over any one of JAGER, HOON, IKAWA and HACKENJOS. The Official Action states that each of these references discloses packing elements in the form of a sphere with a bore. While the disclosed preferred use of each is not in a water treatment plant, it is concluded that carriers may obviously be used for such a purpose as could any known packing element.

Claims 8-10 were rejected under 35 USC 103(a) as being unpatentable over the German reference 39 16 520 or OSHIMA et al.

in view of any one of JAGER, HOON, Jr., IKAWA, HACKENJOS, SANYAL, CHOUN or German references '629 and '617. The Official Action states that these claims differ from the primary reference to OSHIMA et al. and the German '520 in the recitation of carriers having the form of spheres with bores and a textured or patterned surface. The secondary references are each relied upon to show the use of such packing elements. It is concluded that their use in either one of the primary references would have been obvious to one of ordinary skill in the art as it would amount to a mere substitution of a known packing element for another.

Reconsideration of the above rejections is respectfully requested for the following reasons.

By the present amendment, it will be seen that newly-presented independent claim 21 includes the subject matter formerly recited in claims 1, 3, 4 and 5, thereby obviating and rendering moot all of the rejections based on 35 USC 102(b).

Indeed, newly-presented claim 21 requires a treatment chamber containing generally <u>buoyant</u> sludge carrier elements confined between an upper screen element and a lower screen element. Such an arrangement means that, in use, the downward flow of liquid from the inlet to the apparatus, combined with a downward flow of liquid after it leaves the vertical column recited in claim 21, keeps the sludge carrier elements in continuous <u>upward and downward</u> motion within the containment volume, as the treatment plant is in operation. This containment

means that the sludge carrier elements reciprocate upwards and downwards within the treatment chamber with **and against** the flow. This innovative reciprocal movement provides a process intensification effect when the treatment plant is in operation, such that there is enhanced exposure of the microorganisms on the sludge carrier elements to the material contained in the waste water. In addition, the upward and downward movement of the sludge carrier elements with and against the flow of the liquid causes the carrier elements to collide with each other, thereby shedding excess microbial biomass, as is explained on page 5, lines 19-25 of the original specification. Another significant feature stemming from the movement of the sludge carrier elements with and against the flow is to ensure that they do not aggregate into a clogged mass that can occur with other devices.

Thus, the waste water treatment plant as recited in newly-presented independent claim 21 has a vertical column within the treatment chamber through which fluid alone, that is without entrained sludge carrier elements, passes. This fluid discharges over the top of the vertical column to flow downwardly toward a confined mass of buoyant sludge carrier elements causing the latter to rise and fall against the prevailing downward direction of the fluid flow.

It is respectfully submitted that the above-claimed characteristic features are neither disclosed, nor suggested by

the German reference, alone or in combination with any of the secondary references.

Indeed, the German reference discloses an arrangement in which the packing material is not confined as is required by newly-presented independent claim 21. In the arrangement of this German reference, the air mixed in pump 30 causes fluid, with the packing elements 28 entrained in it, to flow upwardly through the column 21 to set up a vertically circulating flow. In such an arrangement, because the packing elements are entrained with the flow and not confined, there is little or no movement of the packing elements relative to the prevailing liquid flow direction. Consequently, there is no process intensification, nor enhanced self-cleaning of the sludge carrier elements as achieved by the characteristic features of newly-presented independent claim 21. Specifically, the German reference fails to disclose buoyant sludge carrier elements. Moreover, the German reference also fails to disclose an upper screen element, which in combination with a lower screen element, confines the sludge carrier elements into the treatment chamber. It follows that this German reference also fails to disclose and suggest an arrangement in which the sludge carrier elements move up and down within the containment volume, both with and against the flow of the liquid.

It is respectfully submitted that new claim 21 structurally and patentably distinguishes from the German reference.

Turning now to the other cited references, STUTH discloses an arrangement in which buoyant media 17 float and are confined beneath the grating 7. However, in such an arrangement the buoyant media 17 is stationary and there is no reciprocal movement as required by newly-presented claim 21. It is respectfully submitted that the technology of circulating packing element as set out in the German reference would be incompatible with the fixed bed type system of STUTH, such that it would not have been obvious to a person having ordinary skill in the art to combine these two conflicting technologies.

Similarly, CROSBY discloses a fixed bed system with none of the processing intensification features afforded by the typically moving sludge carrier elements of the present invention.

The patented reference to YABUUCHI et al. shows an arrangement in which diatomaceous earth particles circulate through a central column to overflow into an outer treatment chamber (coagulation and/or flocculation) with a sedimentation zone on the outside. The sludge carriers are unconfined and again, tend to move with the flow rather than back and forth relative thereto. Moreover, the particles are of diatomaceous earth as opposed to buoyant sludge carrier elements. Finally,

there is no bio-film collection region, and certainly not one where the sludge carrier elements are isolated therefrom.

The Japanese reference 3-101896 discloses an arrangement in which sludge carriers circulate both through the treatment chamber and the vertical column. Accordingly, there is no suggestion of using confined buoyant sludge carrier elements, nor of a generally vertical column through which the liquid, but not the sludge carrier elements, circulates as is achieved by applicant's treatment plant recited in newly-presented independent claim 21.

The OSHIMA et al. reference depicts a system in which a fixed, corrugated biofilm growth carrier is provided outside a central air lift column. There is simply no disclosure or suggestion of mobile sludge carrier elements movable in the treatment chamber as opposed to a fixed corrugated support element. This arrangement has none of the processing specification advantages afforded by the presence of mobile sludge carrier elements confined in a treatment chamber, as recited by the present invention.

While the other secondary references may disclose the features for which they were relied upon, they nevertheless fail to remedy the fundamental shortcomings of the primary references, so as to render the claimed subject matter of claim 21 obvious within the meaning of 35 USC 103. It is respectfully submitted that when considering the applied references collectively, there

would be no reason, motivation or suggestion to combine their respective teachings in the manner necessary to achieve the herein-claimed invention. Indeed, the combined teachings of these references would not have resulted in a waste water treatment plant having the structural and characteristic features recited in applicant's newly-presented independent claim 21.

The Primary Examiner had kindly indicated that claims 14 and 15 would be allowable if rewritten in independent form. By the present amendment, it will be seen that newly-presented independent claim 33 corresponds to the combination of former claim 1 with the feature of the secondary settlement chamber of former claim 14. Similarly, newly-presented independent claim 35 includes the allowable subject matter of former claims 1, 12, 13 and 14. Since dependent claims 34 and 36-40 depend from an otherwise allowable claim, they are also believed to be patentable by virtue of this dependency.

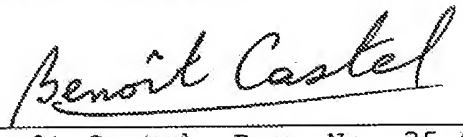
In view of the present amendment and the foregoing Remarks, therefore, it is believed that this application has been placed in condition for allowance. Reconsideration and allowance on the basis of new claims 21-40 are earnestly solicited.

In the event there are any questions relating to this amendment or to the application in general, it would be appreciated if the Primary Examiner would contact the undersigned attorney so as to expedite prosecution of this application.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

YOUNG & THOMPSON



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